



December 16, 2015

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ATTN: Aquifer Exemption

Submitted electronically via Comments@conservation.ca.gov

On behalf of the Natural Resources Defense Council (“NRDC”), which has 2.4 million members and activists, more than 380,000 of whom are Californians, and Clean Water Action (“CWA”), which has 1 million members nationwide, 50,000 of whom are Californians, we write to submit our comments on the supplemental information for the proposal to expand the current aquifer exemption designation for the Dollie Sands of the Pismo Formation in the Arroyo Grande Oil Field located in unincorporated San Luis Obispo County, near the intersection of Ormonde Road and Price Canyon Road.

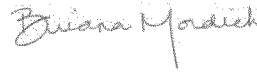
The supplemental information has not addressed the serious concerns we raised in our previous comment letters and contains nothing that would lead us to change our previous assessment that both the current exemption and the proposed expansion may endanger Underground Sources of Drinking Water (“USDW”). Neither the original application nor the supplemental information contains a meaningful hydrogeological analysis or the data required to support a defensible groundwater flow model. As we also stated in our previous letters, the proposed aquifer exemption at issue here fails to meet even the U.S. Environmental Protection Agency’s (“EPA”) inadequate and outdated exemption criteria, much less the more stringent “beneficial use” requirements set forth in the California Public Resources Code. We therefore renew our objection to this aquifer exemption expansion, and again ask the Division and the Water Boards to reject this application and refrain from sending it on to EPA for approval.

We also renew our objection to the use of the existing, outdated exemption criteria. These criteria are wholly inadequate to protect usable groundwater, and no additional exemptions should be granted under these dangerous criteria.

Respectfully submitted,



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Criterion 146.4(a) Has Not Been Met

In order to receive an exemption, the applicant must demonstrate that the proposed aquifer exemption meets the criteria at 40 CFR §146.4(a), which states that an aquifer can only be exempted if “(a) It does not currently serve as a source of drinking water.” The applicant has not adequately demonstrated that the proposed aquifer does not currently serve as a source of drinking water.

In attempting to justify criteria 146.4(a) the supplemental information includes a new map displaying the spatial locations of the nearest drinking water wells which are located outside of the aquifer exemption boundary. The nearest wells are located approximately 1,000 feet south of the exemption boundary, while the remaining wells are within roughly one mile from the aquifer exemption boundary. The applicant, DOGGR, and SWRCB still have not provided geospatial information for the nearby water supply wells or well logs and completion reports.

It appears that the proposed aquifer exemption boundary was drawn in an effort to avoid current water wells rather than actually performing the analysis necessary to determine whether the proposed injection activities could impact those wells. EPA recommends performance of a capture zone analysis (“CZA”) to demonstrate criteria 146.4(a); however, the applicant did not perform such an analysis and the concept is not even discussed in the proposed exemption application.¹ The CZA is a scientific characterization of radius of influence around a given pumping well, which largely depends on the pumping rate and intrinsic structural aquifer characteristics (See figure 1). In other words, groundwater located substantial distances laterally and vertically could be ‘currently’ used by a private well owner, because the radius of influence is drawing water. As EPA states, “a drinking water well's current source of water is the volume (or portion) of an aquifer which contains water that will be produced by a well in its lifetime.”² NRDC raised these issues in our previous written comments and this was not addressed or acknowledged.

¹ Grevatt, Peter. (July 24, 2014). *Enhancing Coordination and Communication with States on Review and Approval of Aquifer Exemption Requests Under SDWA*. [Memorandum]. Washington, D.C.: U.S. Environmental Protection Agency, Office of Groundwater and Drinking Water.

² *Ibid.*

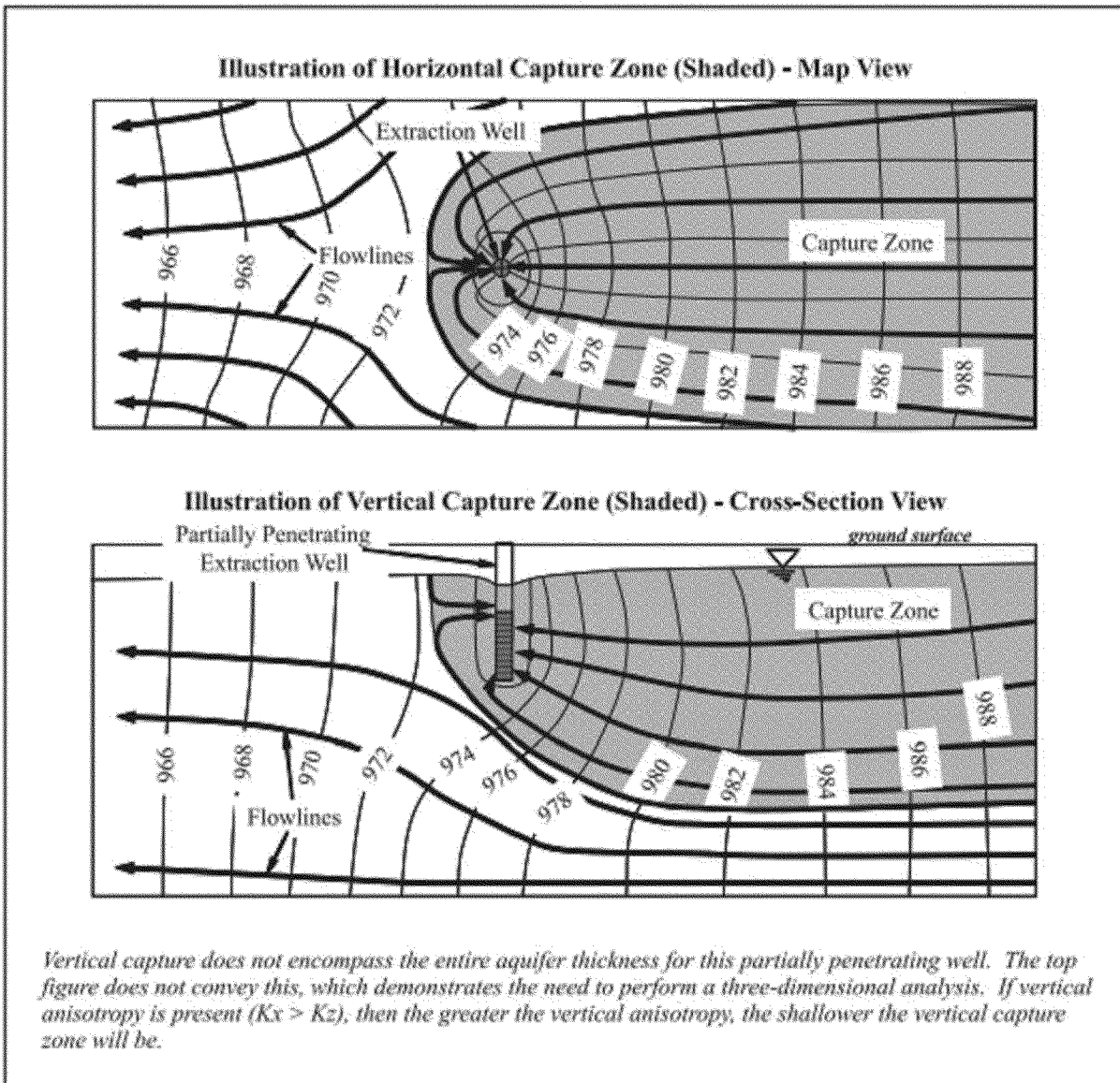


Figure 1: Illustration of horizontal and vertical capture zones. Source: U.S. Environmental Protection Agency, National Risk Management Research Laboratory, Office of Research and Development. (2008). *A Systematic Approach for Evaluation of Capture Zones at Pump and Treat Systems, FINAL PROJECT REPORT*. Washington, D.C.: U.S. Environmental Protection Agency.

In other words, arbitrary land boundaries have absolutely no impact on subsurface flow and groundwater contaminant transport. While the water wells near the proposed aquifer exemption are not *physically* located within the aquifer exemption boundary, the groundwater which those wells withdraw may reside within the aquifer exemption boundary. That would be clarified with CZA analysis; however, a CZA has not been demonstrated and the data required to perform this analysis have not been provided either by the applicant or by the Division of Oil, Gas, and Geothermal Resources (“DOGGR”) or the State Water Resources Control Board (“SWRCB”).

Clearly, this is an important analysis for demonstrating criteria 146.4(a). As we stated in our initial comments, from a recent aquifer exemption in Texas, EPA denied a portion of a proposed aquifer exemption boundary due to "...significant lack of ground water elevation data for this area."³ Furthermore, EPA stated "EPA cannot accurately determine whether the area would currently act as a source of drinking water because of the lack of data needed to determine the ground water flow direction north of the Northwest Fault."⁴ Therefore, EPA rescinded a portion of the aquifer exemption that did not have sufficient ground water information to show that the aquifer was not currently being used.

The anecdotal evidence and numerous vague and/or confusing statements which we noted in our previous comments, indicating that the analysis of existing drinking water wells/uses is incomplete, have not been addressed.

Even with the supplemental information, the proposed aquifer exemption application presents insufficient information on the potential that private well users could be currently drawing water from within the proposed aquifer exemption boundary. Based on the available information, EPA cannot grant this exemption based on 146.4(a).

Criterion 146.4(b)(1) Has Not Been Met

The applicant claims that the proposed aquifer exemption is justified based on the criterion at 40 CFR §146.4(b)(1), which states that an aquifer can be exempted if:

"(b) It cannot now and will not in the future serve as a source of drinking water because:

(1) It is mineral, hydrocarbon or geothermal energy producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II or III operation to contain minerals or hydrocarbons that considering their quantity and location are expected to be commercially producible."

The applicant has not adequately demonstrated that this criterion has been met.

The supplementary information indicates that only twelve of the sixteen existing water disposal wells in the proposed aquifer exemption area have successfully produced oil. The remaining four "indicate the presence of oil within the area proposed for exemption." As we stated in our previous comments, it is not sufficient to simply demonstrate that hydrocarbons are present in the proposed exemption zone; the applicant must also demonstrate that those hydrocarbons are, or can be commercially producible, due to their size and location. The applicant has failed to demonstrate this throughout the entire proposed exemption volume.

Additionally, blanket assumptions regarding previous oil producing wells fails to adequately account for the remaining proposed aquifer exemption area (See Figure 1 in NRDC's comments on the Arroyo Grande aquifer exemption, submitted 21 September 2015). The supplementary information states that "there are 122 wells currently producing oil within the expanded area proposed for aquifer exemption." However, as we showed in our previous comments, the currently active wells - and therefore the location,

³ <http://www.epa.gov/region6/water/swp/groundwater/goliad-aquifer/transmittallettertotceq.pdf>

⁴ *Ibid.*

distribution, and recovery of the economically producible hydrocarbons - are overwhelmingly located within the already exempted portion of the proposed aquifer exemption. Currently, the zone outside the boundary of the existing exemption is host mostly to disposal wells.

Understanding a base water level and hydraulic conductivity, in combination with horizontal and vertical basin characteristics, is how groundwater flow directions are characterized. To reiterate, the applicant, supported by DOGGR and SWRCB, has not collected or presented any of this information, even after a public comment period where these issues were previously raised.

In our previous comment letter, we noted numerous deficiencies with the data the applicant claims shows that criteria 146.4(b) has been met, including deficiencies with the core, well log, and completions data. The supplementary information does not address these deficiencies.

The proposed aquifer exemption boundary must either be revised, the applicant must provide additional information to demonstrate that 40 CFR §146.4(b)(1) is met for the entire proposed exemption volume, or the applicant must rely on a different criterion to justify the exemption.

Containment Has Not Been Demonstrated

As noted in the supplementary information, California Public Resources Code §3131 requires aquifer exemption applicants to demonstrate that “the injected fluid will remain in the aquifer or portion of the aquifer that would be exempted.” This has not been adequately demonstrated.

Basic characterization and understanding of the groundwater hydrogeology is critical to understanding the potential for hazardous contaminants to migrate off-site or interact with adjacent water users. None of this data has been collected or presented. The presence of a certain geological formation has no direct connection to groundwater flow without additional information. In other words, engineers and hydrogeologists cannot quantitatively predict groundwater flow based on geology and well logs alone, which is the only source of information throughout the proposed exemption.

It is unclear still whether the aquifer is confined or unconfined due to the lack of any supporting information necessary to determine head levels. The lack of groundwater flow directional data in the aquifer exemption petition suggests the groundwater flow regimes have not been established. In other words, the applicant does not understand the phreatic (or potentiometric) surface and the groundwater flow direction or groundwater flow velocities.

The injection balance considering the aquifer as a ‘bowl’ does not consider the horizontal and vertical heterogeneities of the aquifer and surrounding water users. Treating this system as a self-contained system where everything ‘flows downhill’ gravely underestimates potential for contaminants to migrate off-site into USDWs.

The application asserts: “The second layer of protection for nearby aquifers is that the bowl is surrounded to the east, south, and west with a layer of nearly impermeable siltstone and claystone called the Miguelito member of the Pismo Formation.”

This statement is inconsistent and not supported by the presence of forty-six water wells drilled into the “Pismo Formation Aquifers,” as shown in the map included with supplemental information (Figure 1: Locations of Water Supply Wells within the Vicinity of the Proposed Aquifer Exemption Boundary). In

other words, private users are actively using the Pismo Formation as a source of groundwater. By definition, an aquifer is a geologic body capable of storing and transmitting significant quantities of water. Therefore, since there's ample evidence that many users are currently discharging groundwater from this aquifer, the assertion that it is impermeable is highly questionable and lacks supporting data. There's no attempt to distinguish the Pismo Formation from the Miguelito Member of the Pismo formation around the project area (see cross-section A-A' of the supplemental information).

The supplemental information asserts that the juxtaposition of oil-bearing sandstones with lower permeability siltstone and claystone across the Arroyo Grande Fault will act as a barrier to migration of injected fluids outside the exempted zone of the aquifer. However, supplemental cross-section A-A' shows that Edna Member sands are present on both sides of the fault, and in fact are in direct contact across the fault in the shallower zones where the Arroyo Grande Fault splays.

The supplementary information still fails to define the intrinsic properties of the "tar seal" that would preclude the transmission of contaminants or potentially impaired groundwater outside the boundary of the proposed exemption. As we stated in our previous comments, the blanket assumption that this "tar seal" will act as an impermeable barrier indefinitely, particularly given the practice of steam injection used in the field, is grossly underestimating the potential for off-site migration of contaminants into USDWs and potential drinking water sources. Further, the supplementary comments still show the surface tar seal as a continuous unit but, as we stated in our previous comments, this is not consistent with geologic maps and cross-sections of the proposed exemption area.

Confinement on east and west side of the proposed exemption boundary has still not been adequately demonstrated. The supplementary information states that the "nearly impermeable siltstone and claystone" of the Miguelito member will prevent the movement of fluids. The supplementary information contains a single value of permeability – 1.7 milidarcies – for the entire Miguelito member, and no porosity data. It is geologically impossible that the entire Miguelito member has the same permeability throughout its entire extent. The supplementary information still does not contain any permeability or porosity maps, cross-sections, or well logs.

Beneficial Use Criteria Are Not Met

As noted in the supplemental information, California Public Resources Code §3131 requires that, "The injection of fluids will not affect the quality of water that is, or may reasonably be, used for any beneficial use." Neither the applicant nor the State has demonstrated that this criterion has been met.

As we stated in our previous comments, neither the Division and Water Boards nor Freeport-McMoRan have produced sufficient evidence that the portion of the aquifer proposed for exemption will not be of any beneficial use in the future. An analysis demonstrating the current and future technical or economic impossibility of beneficial use, based on levels of contamination, ease of access, technological availability of purification options and other factors is missing. In addition, we do not believe that the current data and proposed project operation practices demonstrate hydrologic isolation for the injectate.

To the contrary, it is clear that the water in the proposed exemption area is *currently* serving a beneficial purpose. The applicant is treating 21,000 bwpd of produced water at the Water Reclamation Facility ("WRF"), three quarters of which is discharged into Pismo Creek. As the applicant, DOGGR, and

SWRCB state, this discharge helps support habitat for the Southern California Steelhead and Tidewater Goby and recharges groundwater.

Ongoing injection activity could compromise these beneficial uses. The concentrated waste from the treatment facility is reinjected into the Arroyo Grande oilfield using the disposal wells. Neither the applicant nor DOGGR and SWRCB have analyzed the potential impact to the existing beneficial uses from the injection of this contaminated waste water.

Monitoring Well Issues

As aquifer exemptions are granted in perpetuity, the potential for injected contaminants to migrate offsite is uncertain; however from the currently available data presented in the aquifer exemption application, it's unclear where and when any potential off-site contaminant migration could occur, and what contaminants those might be.

The supplemental information indicates that adding "sentry groundwater monitoring wells" outside the proposed exemption boundary is being "considered." While we support the concept of enhanced monitoring, the supplementary information does not provide sufficient information to determine the adequacy of this monitoring program, or sufficient assurance that such monitoring will even take place. The requirement to perform monitoring must be included in the permit for the injection project. We also ask for clarification on the following issues:

- Given that no information regarding groundwater flow directions has been provided and basic groundwater direction vectors and magnitudes are unknown, how will the State determine where the wells will be placed?
- What depths and aquifers would be monitored?
- With what frequency and duration will the sampling occur? Given that groundwater transport can take years, and therefore, impacts to groundwater beyond the exemption boundary can occur years after the pumps are shut off and operations cease, monitoring needs to continue well beyond plugging and abandonment of the injection wells. Class VI regulations, for example, require monitoring for fifty years post-closure, unless operators can demonstrate that a shorter time frame is appropriate.
- There is no discussion about what water quality parameters would be sampled, what sampling and analysis protocols used, and what quality controls would be implemented. The applicant suggests that groundwater is already contaminated with various toxic compounds (i.e. BTEX, selenium, etc.), therefore, these and other constituents must be identified. We request a full suite of measurements from ICP-MS (heavy metal suite), HPLC (organics), GC (VOCs), and IC (anions, such as nitrates).
- We request a detailed baseline sampling procedure, what concentrations would constitute an 'impact', and what the remedies would be in case of a potential contaminant migration offsite into USDWs.

Conclusion

Both the original exemption application and the supplemental information fail to demonstrate that Federal and State requirements for granting an aquifer exemption have been met. We therefore request that the Division and Water Boards not submit the application to EPA.